EXERCISE APPARATUS

Inventor: Stan Schall, Jr.

EXERCISE APPARATUS

This application claims priority from U.S. provisional Application Serial No. 60/085,291, filed May 13, 1998, which is hereby incorporated by reference.

I. Field of the Invention

This invention relates to a physical exercising device for assisting an individual in performing push-ups. More particularly this invention is a mechanical exercising device having a rotating platform.

II. Background of the Invention

The traditional practice of exercise known as a push-up yields limited muscular and coordination development due to the fixed and stationary nature of the hands. The traditional push-up is capable of causing an individual physical harm in the palm and wrist areas because of the fixed and stationary positioning of the hands to the surface the push-ups are being performed on (e.g., a floor) by the individual. The possible injuries that may occur include the hyperextension of the inner wrist tendons that results when the hands are placed flat on the floor and forearms are forced into a perpendicular position to both the floor and the hands. The traditional push-up movement also causes stresses to the bones and joints in the hands, the wrists, and the arms. Furthermore, the positioning of the hands relative to the arms in a traditional push-up is an awkward position that causes unnecessary pressures in the hands, the wrists, and the arms.

Numerous prior devices have attempted to enhance the scope of muscular and coordination development with a variety of rotating devices to allow the hands to rotate relative to the floor. Examples of prior attempts include U.S. Patent No. 4,768,778 to Thomas, Jr. and U.S. Patent No. 5,358,463 to Fuentes. Both of these patents provide examples of handles on a rotating piece that attempt to better match the natural positioning of the hand to the arm when the hand is gripping an object.

During a course of exercising over time, the human body adapts and strengthens to be able to perform exercises. Consequently, as the individual performs push-ups

over time, the push-ups become easier to perform. To allow for further improvement and development of muscle and coordination, the rotational resistance in performing the push-up needs to be increased. The Fuentes patent is silent on adding resistance to the rotational mechanism. The Thomas, Jr. patent connects two devices together with a rubber band in a figure eight loop around the devices, which is limited to fixed intervals of increasing resistance to both devices. Thus, the prior art is not sufficiently developed to provide for independent and variable increases in resistance to the rotational movement of the handle.

The prior art when attempting to address these problems associated with the traditional push-up have provided elaborate mechanical designs that increases the likelihood that outside substances and particles may not be prevented from encroaching into the internal mechanical aspects of the devices.

Notwithstanding the usefulness of the above-described exercise devices, a need still exists for an exercise device that provides variable and settable rotational resistance for a rotating base with an ergonomical handle. Furthermore, an exercise device with a locking feature to prevent rotation is needed. A way to attach this type of exercise devices to weight machines securely to provide the benefits of allowing the hand to rotate relative to a flat plane is needed. An attachment to adjust the vertical height of an exercise device while allowing for rotation is needed.

III. Summary of the Invention

This invention solves the ongoing and recurring problems of performing a push-up. The invention while addressing the problems of the prior art obtains advantages that were not achievable with the prior art devices.

An object of this invention is to make it safer by decreasing the likelihood of injuries from performing push-ups on a flat surface or performing repetitions on weight machines.

Another object of this invention is to provide a handle that fits better within a partially or completely closed hand.

Another object of this invention is to provide an adjustable level of rotational resistance.

Another object of this invention is to provide a simple mechanical apparatus that is not likely to break because of a complex design.

An advantage of this invention is its versatility for use performing push-ups or repetitions on a weight machine.

Another advantage is the ergonomically designed handle.

Another advantage is a wide range of resistance may be applied to increase or decrease the resistance for the rotation.

~~based on final description and claim content~~

The invention accomplishes the above objectives and achieves the advantages. The invention is easily adapted to a wide variety of situations.

Given the following enabling description of the drawings, the apparatus should become evident to a person of ordinary skill in the art.

IV. Brief Description of the Drawings

The figures show cross-hatching to indicate the presence of solid material, and should not be viewed as indicating any particular type of material.

Figure 1(a) illustrates a top view of the invention with a handle. Figure 1(b) depicts a cross-section of Figure 1(a). Figure 1(c) illustrates the invention being gripped by a user's hand.

Figure 2(a) depicts an angled view of the invention with a punch pad. Figure 2(b) illustrates the invention in use with a hand.

Figure 3(a) illustrates a top view of the invention with a handle and a stopper. Figure 3(b) ~~depicts the invention with a punch pad in use and a stopper~~. Figure 3(c) ~~illustrates a cross-section of Figure 3(a)~~.

Figures 4(a)-(j) illustrate a preferred embodiment of the resistance components. Figures 4(a) depicts a bottom view of the upper housing. Figure 4(b) illustrates a cross-section of this embodiment. Figures 4(c)-(f) and (h) illustrate top views of various components. Figure 4(g) depicts a bottom view of the adjustment mechanism. Figures 4(i)-(j) illustrate side views of components.

Figures 5(a)-(k) depict another embodiment of the resistance components. Figures 5(a) and (c) illustrate bottom view of the upper housing and lower housing cap, respectively. Figure 5(b) illustrates a cross-section of this embodiment. Figures 5(d)-(g) and (i) illustrate top views of various components. Figure 5(h) depicts a bottom view of the adjustment mechanism. Figures 5(j)-(k) illustrate side views of components.

Figures 6(a)-(n) illustrate another embodiment of the invention. Figure 6(a) depicts a bottom view of the upper housing. Figure 6(b) illustrates a cross-section. Figures 6(g)-(k) illustrate top views of various components. Figures 6(l) and (m) depict side views of components. Figure 6(n) illustrates components spaced out along the threaded bolt.

Figures 7(a)-(e) depict another embodiment of the invention. Figure 7(a) illustrates a top view of the lower housing and resistance components, and for exemplary purposes illustrates the supporting posts. Figure 7(b) depicts a cross-section of the invention. Figure 7(c) illustrates a cross-section taken at 7(c)-7(c) of Figure 7(a). Figure 7(d) depicts a bottom view of the upper housing. Figure 7(e) illustrates a cross-section of the upper housing.

Figures 8(a)-(h) illustrates another embodiment of the invention. Figure 8(a) depicts an angled view of the lower housing with supporting posts. Figure 8(b) illustrates a top view of the dial, central passageway, nesting unit, friction material, and

block. Figure 8(c) depicts a perspective view of the block. Figures 8(d)-(g) illustrate different views of the dial. Figure 8(h) illustrates a cross-section of this embodiment.

Figures 9(a)-(j) illustrate another embodiment of this invention. Figure 9(a) illustrate a top view of the lower housing, push bars, friction material, and compression component. Figure 9(b) depicts a cross-section of this embodiment. Figures 9(c)-(f) illustrate top views of different components. Figure 9(g) depicts a bottom view of the adjustment mechanism. Figure 9(h) depicts the push bars and friction material. Figures 9(i)-(j) illustrate side views of components.

Figure 10 depicts an accessory for use with the invention.

Figures 11(a)-(c) illustrate another accessory for use with the invention.

V. Detailed Description of the Invention

The invention will now be described with reference to the drawings, wherein like reference characters designate like or corresponding parts throughout the figures.

The invention is an exercise apparatus to assist in performing push-ups by providing an ergonomic grip for proper wrist and arm alignment, and a rotation of the hands and arms. The device will allow the rotation of the hands/arms to the floor from zero degrees to potentially 360 plus degrees with as little or as much resistance as the user selects for the device to provide.

Sub B1

The base embodiment of the invention preferably includes the following elements: a footing 100, a lower housing (or base) 110, a lower housing cap130, a non-mechanical bearing element 140, and an upper housing (or cover or platform) 150 as shown in Figures 1(a)-2(b). Figures 3(a)-(c) are also illustrative if the stopper structure is ignored. The lower housing 110 and the upper housing 150 rotate relative to each other preferably through the bearing element 140.

The upper housing 150 preferably shrouds and covers the other components and protects them from foreign elements such as sweat from the user. Preferably the upper housing 150 has an internal rim 154 around its inner cavity to engage a corresponding

rim 124 around the outside wall 123 of the lower housing 110 to nest the lower housing 110 within the upper housing 150 as shown in Figure 1(b). The rim 154 of the upper housing 150 preferably slides over the rim 124 of the lower housing 110 to couple and secure the upper housing 150 and the lower housing 110 together. The preferred material for constructing the upper housing 150 and the lower housing 110 is a rigid polymer formed using injection or rotational molding. One of ordinary skill in the art will appreciate that the upper housing 150 and the lower housing 110 may be manufactured out of metal including stainless steel and aluminum, or any other rigid material.

The lower housing ~~120~~ 110 preferably is cylindrical; however, the lower housing may be a variety of shapes as long as there is sufficient surface upon which the upper housing 150 may rotate. The lower housing 110 preferably also includes a flat horizontal bottom surface 121.

Preferably the lower housing 110 is attached to a footing 100. The footing 100 preferably is a non-slip/gripping material positionally stabilizing the exercise apparatus on the underlying surface to minimize sliding created by horizontally directed force vectors, for example, rubber. The footing 100 has a shape to correspond to the bottom surface 121 of the lower housing ~~100~~ 110. The footing 100 may also be a plurality of small pieces spread out over the bottom surface of the lower housing. One of ordinary skill in the art will realize that the bottom surface of the lower housing can be designed in such a manner to provide sufficient friction with a non-slippery surface instead of attaching the footing 100.

A lower housing cap (or lid) 130 covers the lower housing 110 and provides an operation surface for the bearing element 140. The lower housing cap 130 fits over the lower housing 110 to provide a flat surface preferably in a circular shape, but may be of any appropriate configuration, e.g., elliptical, oval, etc. to match the horizontal cross-section of the lower housing. The lower housing cap 130 preferably has a cross-sectional shape corresponding to that of the lower housing 110 to better facilitate the upper housing 150 fitting over the combined lower housing 110 and lower housing cap 130. The lower housing cap may be a solid disc 130 (shown in Figure 1(b)) or donut

shape 130' (shown in Figure 3(b)) as long as sufficient surface area is provided for the bearing element 140 to rest on upon assembly of the apparatus.

The lower housing cap 130 preferably is made of the same type of material as the lower housing 110. As one of ordinary skill in the art will appreciate, the lower housing cap 130 and lower housing 110 may be manufactured as one (unitary) piece. To increase the strength of the lower housing and lower housing cap, an internal weight distributing system 122 such as support posts, skeleton structure or a solid lower housing will assist in distributing the weight of the user that is placed on and transferred down from the upper housing 150. Examples of weight distributing systems are shown for exemplary purposes only in Figures 7(a), 8(a), and 8(h) as 122. The embodiments represented in these Figures do not require the use of a weight distributing system to function.

In accordance with an aspect of the invention, the non-mechanical bearing element may be disposed between the top of the lower housing cap and the upper surface of the inside cavity of the upper housing as shown for example in Figure 1(b). The bearing element facilitates the rotation of the upper housing relative to the lower housing. The bearing element preferably is a pair of washers 140' (shown in Figure 3(b)) or discs 140 (shown in Figure 1(b)), which due to the material properties, will provide more freedom of rotation than is possible with just one washer or disc. The two discs of the bearing will rotate relative to each other quite freely while remaining relatively static to the pieces abutting or adjacent to the bearing. The bearing element preferably is made from Teflon or other similar non-friction (or low friction) material. One of ordinary skill in the art will appreciate an equivalent structure for the bearing element may be realized wherein the lower housing cap and the upper surface of the inside cavity of the upper housing may be coated with Teflon or other similar non-friction (or low friction) material thus eliminating a separate piece for the bearing element. Preferably each of the discs used for the bearing element may have a thickness up to and including 0.20 inches thick, more preferably within a range of 0.05 to 0.15 inches thick, and most preferably in the range of 0.0625 to 0.125 inches where the end points of each range are included within the range.

Preferably a handle 152 extends from the upper housing 150 as shown in Figures 1(a)-(c). The handle 152 extending from the upper housing 150 preferably includes two upright portions connected by a gripping area. The two upright portions 160, 162 are of different heights to place the gripping area 164 at an angle to the plane of the upper housing area. The two upright portions 160, 162 preferably have different diameters to match the diameter of the respective end of the gripping area 164. The lower end of the gripping area 164 is preferably positioned at an angle of about 14 degrees from the horizontal plane. The gripping area 164 is tapered in a conical shape to better fit within a user's hand as shown in Figures 1(c). The taper of the gripping area 164 provides a better fit within the palm of the user's hand because of the natural taper that exists within a partially or completely closed hand from the pointer finger to the pinkie finger of the hand. The gripping area 164 preferably has an arch 166 near the center of the top surface of the handle 152. The arch, which extends outside of the tapering envelope, accommodates the slight valley that exists within the palm of the hand.

The handle 152 may be manufactured from a rigid material, preferably a polymer or metal. The gripping area of the handle may further include foam, rubber, polypropylene, polyvinyl chloride, silicones, or thermoplastics that encases the rigid polymer or the metal. More preferably, the gripping area of the handle may be manufactured from foam or rubber that encases the rigid polymer or the metal.

The handle 152 preferably is integrally formed with the upper housing 150 as one piece. The handle 152, if made as a separate piece that is attached to the upper housing 150, may be attached using an adhesive like epoxy or mechanical means like screw or bolts.

The gripping area may be modified to include finger grips primarily along the lower surface of the gripping area while still maintaining the general taper nature of the handle.

The invention may include a punch (or fist) or similar pad 152' in place of the handle as shown in Figure 2(b). The punch pad 152' is similar to the pads that are

commonly found on weight machines and are well known in the art. The punch pad 152' is of sufficient thickness to provide padding for a clinched fist to stand in or rest in performing push-ups while utilizing this invention. The punch pad 152' helps cradle the fist while simultaneously strengthening the skin surfaces on the impact face of the fist. The punch pad when used recreates the motion and positioning of the most critical muscles utilized while executing the punching motion and therefore increases the effectiveness of the activity while simultaneously decreasing the chance for injury. The punch pad 152' also assists in developing the muscles utilized in the execution of a punch such as muscles located, for example, in the hand, the wrist, the arm and the shoulder of the user. The punch pad 152' also allows the user to perform push-ups on his/her fingertips using the apparatus as support for the palm area of the hand. The punch pad 152' preferably is attached to the upper housing with an adhesive like epoxy.

The base embodiment provides the common building blocks for the remaining embodiments.

The next embodiment, as shown in Figures 3(a)-(c), includes the footing ~~100~~ 100, the lower housing 110', the lower housing cap 130', the bearing element 140', and the upper housing 150' of the base embodiment of this invention. This embodiment furthers includes a stopper 156'.

The lower housing 110' further includes at least one opening 128' on its wall 123' above the rim 124' around its periphery. The lower housing 110' preferably has a solid bottom. The lower housing cap 130 and the bearing element 140 are preferably both solid discs as shown in Figure 1(b), but may be donut shaped as shown in Figure 3(b). The upper housing 150' may have an opening 151' passing through its wall.

The stopper 156' may be any item that is capable of engaging the opening 128', 151' in both the lower housing and the upper housing to prevent the upper housing from rotating with respect to the lower housing. Preferably the stopper 156' is a rubber or metal plug. For added convenience the stopper 156' may be attached to the apparatus with a string or other similar attachment means to assist in preventing the stopper from being lost.

The stopper may also be a push button attached to the upper housing for engaging an opening in the lower housing. The push button mechanism may be one of the many different types of push button mechanisms known to one of ordinary skill in the art.

One of ordinary skill in the art will appreciate that this embodiment may be modified to provide a consistent amount of friction by locating friction material around the outside of the lower housing wall above the rim to provide a level of resistance for the apparatus above the nominal resistance present in the apparatus. The friction material would have an opening corresponding to each opening present in the lower housing.

The next embodiment of this invention modifies the base embodiment to include regulating components to provide the individual a way to adjust the amount of internal resistance provided by the apparatus to rotating the upper housing relative to the lower housing. The regulating components include a combination of friction material, a compression component, and an adjustment mechanism. The friction material, the compression component, and the adjustment mechanism provide a reliable form of adjustable resistance to rotation between the lower housing and the upper housing. The adjustment capability provided by the regulating components allows the user to change the resistance level from no resistance to a point of complete-locked resistance.

The friction material preferably is made from a sturdy, flexible material capable of providing resistance and friction between two pieces, for example, rubber or leather. Leather meets these friction requirements, and leather has proven to be extremely reliable in providing excellent longevity and performance in similar friction load applications. To increase the level of friction between the upper housing and the lower housing, the surfaces which contact the friction material can include friction enhancing surface irregularities such as scuffing and/or small protrusions to increase the level of friction between the friction material and the rotating parts. When so roughened, it is important to consider in selecting a material that resists undue wear which otherwise would undermine the durability of the friction material.

Preferably the regulating components are made from the same materials as the material used to make the upper housing and the lower housing, i.e., metal or plastic.

With the inclusion of the regulating components, the lower housing, the lower housing cap and the bearing element receive common modifications that are present in each embodiment of the invention with regulating components. The lower housing includes a hole in its base for the adjustment mechanism to pass through and/or be accessed through. In most cases the hole will be one end of a central passageway that has a predominately circular cross-section in the horizontal plane. Depending on the particular embodiment of the regulating components, the central passageway will have sections with different internal diameters. Different embodiments of the regulating components will require that key (or locking) channels extending radially out from the central passageway, for example, the keyway channels 121a extending out from central passageway, for example 111a in Figure 4(h).

The lower housing cap includes an opening with the same or larger diameter than the diameter at the top of the central passageway if one is present in the lower housing. If the central passageway includes keyway channels, then the opening diameter in the lower housing cap will be sufficiently large to provide access from the top of the lower housing to pass the regulating components through the lower housing cap into the central passageway. The bearing element preferably is the same horizontal shape as the lower housing cap and includes an opening with at least the diameter of the opening in the lower housing.

The regulating components and internal housing cavities are appropriately sized to accommodate the possible wear factor of the friction material and still provide the necessary resistance.

One of ordinary skill in the art will appreciate that the regulating components embodiment may be modified to include the stopper elements previously described.

One of ordinary skill in the art will appreciate that the following discussion regarding the elements utilized in the following embodiments is for exemplary purposes.

The various embodiments each have the footing 100, the lower housing, the lower housing cap, the bearing element, the regulating components, and the upper housing just described with any variant of these parts discussed. One of ordinary skill in the art based on the discussion above will appreciate that although the drawings show a handle in connection with the various embodiments that a punch pad may replace the handle, and some Figures illustrate a weight bearing system that may be utilized in any of the embodiments but is not required.

The preferred regulating components are shown in Figure 4(a)-(j). The regulating components in this embodiment are a single compression friction resistance apparatus. This embodiment includes the footing 100, the lower housing 110a, the adjustment device 160, the compression component 170a, the friction material 180a, the lower housing cap 130a, the bearing element 140a, and the upper housing 150a.

The lower housing 110a includes a central passageway 111a with three sections 112a, 116a, 120a. The first section 112a is of sufficient diameter to allow the user to turn the adjustment device 160. The second (or threaded) section 116a is threaded to hold the adjustment device 160 in place during use. One of ordinary skill in the art will readily realize that the second section 116a can subsume the first section 112a. The third (or locking) section 120a preferably is smooth and includes four keyway channels 121a extending radially outward from the central passageway 111a. The keyway channels 121a are for engaging the compression component 170a. The circular diameter of the third section preferably is slightly larger in diameter than the second section to provide a shoulder between the two sections.

The lower housing cap 130a rests on the outer edges of the lower housing 110a and the upper edge of the central passageway 111a. The bearing element 140a rests on the lower housing cap 130a. Both the lower housing cap 130a and the bearing element 140a have a central opening 132a, 142a passing through each of them that preferably is aligned with the central passageway 111a.

The adjustment device 160 preferably is a screw mechanism 164 with a turning handle 162, which can be of any shape easily grasped and turned by an individual not

just the rectangular box shape depicted in the drawings. Preferably the screw mechanism 164 and turning handle 162 are a unitary piece. The compression component 170a includes a base portion 174a and an upper portion 176a. The base portion 174a is cylindrical with four square guide keys 172a extending radially from the periphery to individually engage a respective key channel 121a of the central passageway 111a. The upper portion 176a is tapered inwardly from the base portion 174a to the top of the upper portion. The adjustment device 160 and the compression component 170a may be formed as one piece (e.g., unitary).

The friction material 180a preferably is donut shape or a ring to fit around the upper portion 176a of the compression component 170a.

The upper housing 150a includes a nesting unit 190a for mating with the friction material 180a. The nesting unit 190a extends down from the top of the inside cavity of the upper housing 150a. The nesting unit 190a includes an outside perimeter wall 192a, an inner circular wall 194a, and a central recess area 196a. The inner wall 194a preferably extends down a shorter distance from the upper housing than the outer wall 192a. The friction material 180a nests in a groove 193a formed between the outside wall 192a and the inner wall 194a. The upper portion 176a of the compression component 170a is receivable into the recess area 196a.

The user can adjust the amount of rotational resistance of the device by rotating the adjustment device 160 using the turning handle 162. As the adjustment device 160 is turned, the screw mechanism 164 moves relative to the threaded section 116a of the central passageway 111a and moves the compression component 170a in the vertical direction. If the adjustment device 160 is turned clockwise, then the compression component 170a moves upwards forcing the friction material 180a to compress against the groove 193a formed by the inner and outer walls 192a, 194a of the nesting unit 190a. With increased compression of the friction material 180a, the rotational resistance is increased between the upper housing 150a and the compression component 170a, which engages the lower housing 110a. If the adjustment device 160 is turned counterclockwise, there will be less compression of the friction material 180a

between the compression component 170a and the nesting unit 190a, and thus less resistance.

Another embodiment of the regulating components is shown in Figure 5(a)-(k). The regulating components in this embodiment are an upper connecting shaft compression friction resistance apparatus. This embodiment includes the footing 100, the lower housing 110b, the adjustment device 160, the compression component 170b, the friction material 180a, the lower housing cap 130b, first and second bearing element 140a, 145b, and the upper housing 150b.

The lower housing 110b includes a central passageway 111b with three sections 112b, 116b, 120b. The first section 112b is of sufficient diameter to allow the user to turn the adjustment device 160. The second (or threaded) section 116b is threaded to hold the adjustment device 160 in place during use. One of ordinary skill in the art will readily realize that the second section 116b can subsume the first section 112b. The third (or rotating) section 120b preferably is smooth.

The lower housing cap 130b rests on the outer edges of the lower housing 110b and the upper edge of the central passageway 111b. The lower housing cap 130b preferably includes a mating area 134b with a similar structure to that present in the previous embodiment as part of the nesting unit 190a of the upper housing except the recess is an opening. The friction material 180a nests in a groove 136b formed by the outside wall 135b, which aligns with the central passageway 111b. The mating section 134b abuts the third section 120b of the central passageway 111b. This design reduces the expense of manufacturing when the lower housing and the lower housing cap are made from a rigid polymer.

The first bearing element 140a rests on the lower housing cap 130b. The first bearing element is the bearing element previously discussed. Both the lower housing cap 130b and the first bearing element 140a have a central opening passing through each of them.

The adjustment device 160 preferably is a screw mechanism 164 with a turning handle 162. Preferably the screw mechanism 164 and turning handle 162 are a unitary piece. The compression component 170b includes a base portion 174b and an upper portion 176b. The base portion 174b is cylindrical, and may be eliminated to decrease the overall height of the device. The upper portion 176b is tapered inwardly from the base portion 174b to the top of the upper portion 176b. A recess or cavity 178b is formed as an indention into the top surface of the upper portion 174b to engage the upper housing 150b. The recess 178b is shape such that when engaged by the upper housing 150b, the compression component 170b will rotate with the upper housing 150b. The recess 178b preferably includes four keyway channels 179b that extend away from each other to form a "X" or a cross.

Between the adjustment device 160 and the compression component 170b is the second bearing element 145b, which allows the adjustment device 160 and the compression component 170b to freely rotate to each other. The second bearing element 145b preferably is a pair of washers or discs to provide more freedom of rotation than is possible than with just one washer or disc. The use of two washers or discs allows for them to rotate to each other and remain relatively static as compared to the adjustment device 160 and compression component 170b, respectively. As discussed above in connection with the common bearing element, the second bearing element may be a coating on the top surface of the adjustment device and a coating on the bottom surface of the compression component.

The upper housing 150b includes a column 200b for engaging the recess 179b in the compression component 170b. The column 200b extends down from the top of the inside cavity of the upper housing 150b. The column 200b preferably includes four guide keys 202b that extend away from each other to form a "X" or a cross, i.e., a shape that corresponds to the recess in the compression component. The column 200b nests within the recess 179b of the compression component 170b to have the upper housing 150b and compression component 170b rotate in unison.

The column, as shown in Figures 5(a)-(b), to increase the strength of the upper housing and withstand the rotational forces may include a taper upper portion 204b that has a larger diameter adjacent to the top of the inner cavity than the diameter adjacent the four guide keys 202b. With this design the guide keys can either extend the full height of the column (not shown), blend into the tapered portion while maintaining their walls at the same radial distance from the center of the column throughout their vertical distance (not shown), or the taper upper portion 204b has a lower diameter corresponding to the length across two opposing guide keys 202b (as shown).

The user can adjust the amount of rotational resistance of the device by rotating the adjustment device 160 using the turning handle 162. As the adjustment device 160 is turned, the screw mechanism 164 moves relative to the threaded section 116b of the central passageway 111b and moves both the second bearing element 145b and the compression component 170b in the vertical direction. If the adjustment device 160 is turned clockwise, then the compression component 170b moves upwards forcing the friction material 180a to compress against the groove of the mating section 134b of the lower housing cap 130b. With increase compression of the friction material 180a, the rotational resistance is increased between the compression component 170b, which engages the upper housing 150b, and the lower housing 110b via the lower housing cap 130b. If the adjustment device 160 is turned counterclockwise, there will be less compression of the friction material 180a between the compression component 170b and the mating section 134b of the lower housing cap 130b.

A modification to this embodiment is that the lower housing 110b includes the mating section 134b of the lower housing cap 130b. This modification utilizes the lower housing cap as described in connection with the previous embodiment.

Another embodiment of the regulating components is shown in Figure 6(a)-(n). The regulating components in this embodiment are a dual compression friction resistance apparatus. This embodiment includes the footing 100, the lower housing 110c, the adjustment device 160c, first and second compression component 170c, the

friction material 180c, the lower housing cap 130a ~~130~~, first and second bearing element 140a, 145c, and the upper housing 150c.

The lower housing 110c includes a central passageway 111c with two sections 112c, 120c. The first section 112c is of sufficient diameter to allow the user to turn the adjustment device 160c. The second (or locking) section 120c preferably is a larger diameter than the first section. ~~and the~~ The junction between the first and second sections 112c preferably forms a shelf ~~119c~~ 115 for the first compression component 170c to sit and rest upon. As one of ordinary skill in the art will appreciate, the shelf ~~119c~~ 115 may extend across the opening of the first section 112c to the extent that the opening through the shelf ~~119c~~ 115 is sufficiently large enough to allow the adjustment device 160c to pass therethrough. The height of the second section 120c preferably is not greater than the combined height of the first compression component 170c and the friction material 180c.

The lower housing cap 130a rests on the outer edges of the lower housing 110c. There is a sufficient space between the top of the central passageway 111c and the lower housing cap 130c to allow a nesting unit 190c from the upper housing 150c to extend into the lower housing 110c. The first bearing element 140a rests on the lower housing cap 130a and is the common bearing element previously discussed. Both the lower housing cap 130a and the first bearing element 140a have a central opening passing through each of them.

The adjustment device 160c preferably includes a nut 166c, a screw mechanism 162c, 164c, and a securing mechanism 167c, 168c. The screw mechanism preferably is a threaded stud 164c with a handle at the bottom end 162c. More preferably, the screw mechanism is a "T" handle ended threaded stud. The securing mechanism is placed on the end of the screw mechanism opposite the handle to secure the compression components 170c, the second bearing element 145c, and the friction material 180c along the threaded stud 164c. The securing mechanism preferably is one or some combination of the following: two nuts with or without adhesive like epoxy and a washer, one nut with adhesive and a washer, a nylock nut and a washer, a

nut/washer combination with adhesive, or any other device which will withstand the torque and rotational forces applied by the second compression. The most preferable of these for the securing mechanism is the two nuts 168c, 168c with a washer 167c, which allows for the easiest manufacture of this embodiment.

The first and second compression components 170c, 170c preferably are flat. The first and second compression components preferably are unattached to the screw mechanism 164c and freely rotate independently of the screw mechanism. Each compression component 170c, 170c preferably is a stocky cylindrical unit with four guide keys 172c radially extending from the periphery of the cylindrical portion. The guide keys 172c preferably are square or other shape capable of locking into and engaging the keyway channels 121c, 198c, respectively, present in the lower housing 110c and upper housing 150c.

The second bearing element 145c preferably is free-floating and centered about the threaded portion 164c of the screw mechanism. The second bearing element 145c is located between the second compression component 170c and the washer 167c of the adjustment device 160c. The second bearing element 145c preferably is a pair of washers or discs to provide more freedom of rotation than is possible than with just one washer or disc. The use of two washers or discs allows for them to rotate to each other and remain relatively static as compared to the washer 167c and the second compression component 170c, respectively. As discussed above in connection with the common bearing element, the second bearing element may be a coating on the top surface of the adjustment device and a coating on the bottom surface of the compression component. The second bearing element allows the adjustment device 160c to rotate independently of the upper housing 150c and the second compression component 170c.

The upper housing 150c includes a nesting unit 190c for mating with the second compression component 170c. The nesting unit 190c extends down from the top of the inside cavity of the upper housing 150c. The nesting unit 190c includes a wall and a central recess area 196c. The central recess area 196c is predominately circular with

keyway channels 198c radially extending into the wall from the periphery of the circular portion. The keyway channels 198c engage and receive the guide keys 172c of the second compression component 170c. The second compression component 170c and the second bearing element 145c nest within the central recess 196c.

The user can adjust the amount of rotational resistance of the device by holding the handle 162c of the screw mechanism and rotating the nut 166c to 1) apply or decrease pressure against the first compression component 170c and 2) change the distance between the nut 166c and the securing device 167c, 168c depending on the direction the nut 166c is turned. If the nut 166c is turned clockwise, then the first and second compression components 170c, 170c will be drawn together to sandwich the friction material 180c. As the amount of compression increases of the friction material 180c, the amount of friction increases and thus the rotational resistance increases between the first and second compression components 170c, 170c. The rotational resistance between the upper housing 150c and the lower housing 110c is related to the rotational resistance between the first and second compression components 170c, 170c, because the first and second compression components 170c, 170c, respectively, are engaged with the upper and lower housing 150c, 110c. If the adjustment device 160c is turned counterclockwise, there will be less compression of the friction material 180c between the first and second compression components 170c, 170c and thus between the upper and lower housings 150c, 110c.

A slight modification of this embodiment will allow the second section of the central passageway 120c and the first compression component 170c to be eliminated. The shelf ~~119c~~ 115 then is extended across the top of the first section with an opening of at least sufficient diameter for the threaded stud 164c to pass therethrough, and still provide sufficient compression forces as discussed above in connection with the first compression component 170c.

A further modification is to provide a threaded opening through the shelf 119c to engage the threaded stud 164c. Yet another modification is to have the shelf include a recess on its bottom surface to nest and lock in rotational place the nut 166c of the

adjustment device 160c. The washer 170c then would apply the compression forces in conjunction with the shelf.

Another embodiment of the regulating components is shown in Figure 7(a)-(e). The regulating components in this embodiment are a constricting belt friction resistance apparatus. This embodiment includes the footing 100, the lower housing 110d, the adjustment device 160d, the friction material 180d, the lower housing cap 130a, the bearing element 140a, and the upper housing 150d.

The lower housing 110d is a hollow cylinder and includes a slot 111d along its bottom surface 121d. The lower housing 110d includes a fastening post 125d for attaching to the friction material 180d. The lower housing 110d preferably includes two pieces 126d, 127d to position the adjustment device 160d over the slot 111d. The two pieces 126d, 127d preferably are within the internal cavity and aligned on opposite sides of the slot 111d.

The upper housing 150d includes a center shaft 210d. The center shaft 210d preferably is hollow but sufficiently thick to withstand the forces associated with the friction material 180d being wrapped around its outside circumference. The center shaft 210d passes through the lower housing cap 130a and the bearing material 140a into the internal cavity of the lower housing 110d to be wrapped with the friction material 180d preferably at least one time.

The lower housing cap 130a rests on the outer edges of the lower housing 110d. The bearing element 140a rests on the lower housing cap 130a. Both the lower housing cap 130a and the bearing element 140a are donut shape thus providing a hole or passageway for the center shaft 210d of the upper housing 150d to pass through.

The friction material 180d preferably is a cord or a belt that wraps around the center shaft 210d of the upper housing 150d. The friction material 180d is held in place by the fastening post 125d and the adjustment device 160d.

The adjustment device 160d includes a screw mechanism and a fastening mechanism. The fastening mechanism preferably is a nut 166d that rotates about the

screw mechanism 164d, more preferably the nut 166d is a high hexagonal nut. The fastening mechanism preferably also includes a washer or similar device 167d that is not threaded onto the screw mechanism 164d, and more preferably the washer 167d is a high washer. The nut 166d moves the washer 167d along the screw mechanism 164d. Preferably the washer 167d is attached to the friction material 180d preferably using crimping; however, if the washer 167d is not present, then the nut 166d will attach directly to the friction material 180d.

The screw mechanism preferably is attached and connected to the engagement pieces 126d, 127d of the lower housing 110d. The screw mechanism runs parallel and above the slot 111d in the lower housing 110d allowing the user to rotate the fastening mechanism for adjusting the rotational resistance. The screw mechanism preferably is a threaded bolt or screw with a non-threaded end piece, and more preferably the screw mechanism is a threaded bolt 164d with at least one hexagonal end 162d. The hexagonal end 162d nests within a box 126d, which is one of the engagement pieces of the lower housing 110d, that has an open top and a cavity formed to engage and lock in place the hexagonal end 162d. The other end of the threaded bolt 164d rests within a second box 127d with an open top and a cavity formed to engage the other end of the threaded bolt 164d. Both ends of the threaded bolt may be further held in place with an adhesive like epoxy to prevent the threaded bolt from rotating ~~was~~ while in place in the lower housing.

The user can adjust the amount of rotational resistance of the device by rotating the nut 166d along the screw mechanism 164d through the slot 111d of the lower housing 110d. As the nut 166d is turned, the friction material 180d is loosened or tightened around the center shaft 210d. If the nut 166d is rotated radially outward from the center of the device, then the friction material 180d is constricted and tightens around the center shaft 210d. As the friction material 180d is tightened the rotational resistance is increased for the upper housing 150d to rotate relative to the lower housing 110d. If the nut 166d is rotated radially inwardly toward the center of the device, then the friction material 180d will be looser around the center shaft 210d thus

decreasing the rotational resistance between the upper housing 150d and the lower housing 110d.

One of ordinary skill in the art will appreciate that a winch mechanism may replace the screw mechanism, the fastening mechanism, and the engagement pieces in the above embodiment and still obtain the same functionality. In this modification, the friction material 180d will be connected to the winch. The winch will include a handle or other turning instrument accessible through the bottom of the lower housing.

One of ordinary skill in the art will also appreciate that the center shaft 210d may be replaced by a pulley fixed to a rod extending down from the upper housing 150d in place of the center shaft. The friction material 180d in this modification preferably wraps around the pulley such that the friction material 180d when viewed from above does a 180 degree turn.

Another embodiment of the regulating components is shown in Figure 8(a)-(h). The regulating components in this embodiment are an expansion belt friction resistance apparatus. This embodiment includes the footing 100, the lower housing 110e, the adjustment device 160e, the friction material 180e, the lower housing cap 130a, the bearing element 140a, and the upper housing 150e.

The upper housing 150e includes a nesting unit 190e. The nesting unit 190e extends down from the top of the inside cavity of the upper housing 150e. The nesting unit 190e preferably is a hollow cylinder centered with the radial center of the upper housing 150e.

The lower housing 110e preferably is a hollow cylinder with a hole passing through the center of the bottom surface. The lower housing 110e includes a central passageway 111e divided into two sections 112e, 120e extending from the bottom surface. The two sections 112e, 120e are separated by a shelf 115e. The second section 120e includes a series of teeth around its inner perimeter, a channel 117e through the wall at the top of the section, and a slot 118e on the outside of the wall at the top of the wall spaced from the channel 117e. A block 220e is placed in the slot

118e such that the block 220e extends radially out from the center of the central passageway 111e to fill at least some of the space between the nesting unit 190e and the central passageway 111e. The block 220e acts as a stop to the friction material 118e wrapping any further around the central passageway 111e.

The lower housing cap 130a rests on the outer edges of the lower housing 110e. The bearing element 140a rests on the lower housing cap 130a.

The adjustment device preferably is a dial 160e with a series of teeth around its outer periphery for engaging the teeth of the central passageway 111e. The dial 160e includes a recess 163e in from its outside periphery along the top of the dial. The size of the recess 163e controls the range of rotational resistances possible with the device; because the larger the capacity of the recess 163e is, the more friction material 180e that can be stored within the recess 163e. The dial 160e also includes a knob 162e that is a smaller diameter than the rest of the dial 160e such that a shoulder is formed between the knob 162e and the remainder of the dial 160e as shown in Figures 8(d)-(f). The shoulder rests on the shelf 115e of the lower housing 110e. Preferably the dial 160e is solid.

The friction material 180e preferably is a belt or cord that runs from the recess 163e in the dial 160e through the channel 117e in the central passageway 111e around the central passageway 111e to the block 220e extending from the central passageway 111e. This structure does not require that the friction material 180e be attached to either of the recess 163e and the block 220e given the limited amount of rotation of the dial 160e is dependent on the radially width of the channel 117e in the central passageway 111e. The friction material 180e may be attached using adhesive such as epoxy, mechanical, or other attachment means known to one of ordinary skill in the art.

When the device is assembled the nesting unit 190e will fit over the friction material 180e, the central passageway 111e, the block 220e and the dial 160e. The amount of friction material 180e present between the nesting unit 190e and the central passageway 111e will determine the level of rotational resistance between the upper housing 150e and the lower housing 110e.

The user can adjust the amount of rotational resistance of the device by rotating the dial 160e. As the dial 160e is turned, the amount of friction material 180e located between the nesting unit 190e and the central passageway 111e will change. If the dial 160e is turned clockwise, then more friction material 180e will be forced into the area between the central passageway 111e and the nesting unit 190e. With the increase presence of the friction material 180e, the rotational resistance is increased between the nesting unit 190e, which is part of the upper housing 150e, and the central passageway 111e, which is part of the lower housing 110e. If the dial 160e is turned counterclockwise, the friction material 180e will be retracted into the area that exists between the dial recess 160e and the channel 117e. The decrease in the amount of the friction material 180e present between the nesting unit 190e and the central passageway 111e will decrease the rotational resistance between the upper housing 150e and the lower housing 110e.

One of ordinary skill in the art will appreciate that a winch mechanism can replace the dial in the above embodiment to allow for the capacity to use more friction material. The more friction material available for use, the greater the range of rotational resistances that will be provided by the device.

Another embodiment of the regulating components is shown in Figure 9(a)-(j). The regulating components in this embodiment are a push bar displacement friction resistance apparatus. This embodiment includes the footing 100, the lower housing 110f, the adjustment device 160, the compression component 170f, two push bars 230f, two pieces of friction material 180f, the lower housing cap 130a, the bearing element 140a, and the upper housing 150.

The lower housing 110f includes a central passageway 111f and a horizontal channel 113f that preferably is rectangular. The central passageway 111f and the horizontal channel 113f when dissected along the length of the horizontal channel 113f form a "T". The central passageway 111f preferably includes three sections 112f, 116f, 120f, any of which may be combined together into one section. The first section 112f is of sufficient diameter to allow the user to turn the adjustment device 160. The second (or threaded)

section 116f is threaded to hold the adjustment device 160 in place during use. One of ordinary skill in the art will readily realize that the second section 116f can subsume the first section 112f. The third (or rotating) section 120f preferably is smooth and nests the compression component 170f. Each of the sections preferably has the same diameter taking into account the threads in the second section.

The lower housing cap 130a rests on the outer edges of the lower housing 110f and may also rest on the upper edge of the channel 113f and central passageway 111f. The bearing element 140a rests on the lower housing cap 130a.

The adjustment device 160 preferably is a screw mechanism 164 with a turning handle 162. The compression component 170f is tapered from its bottom towards its top. The adjustment device 160 and the compression component 170f preferably are formed as one piece (e.g., unitary).

The push bars 230f have tapered ends that abut the compression component 170f. The push bars 230f rest in the horizontal channels 113f and move radially in and out from the center. The push bars 230f contact the friction material 180f. The friction material 180f preferably is box shaped. The shape of the face of the friction material 180f that contacts the push bars 230f corresponds to the lateral cross-sectional shape of the push bars ~~130f~~ 230f, and preferably for ease in operation the friction material 180f has a substantially uniform cross-section in the radial direction.

The user can adjust the amount of rotational resistance of the device by rotating the adjustment device 160, the compression component 170f vertically moves against the push bars 230f. If the adjustment device 160 is turned clockwise, then the compression component 170f moves upwards forcing the push bars 230f radially out along the horizontal channel 113f against the friction material 180f. The friction material 180f is pressed against the inner wall of the upper housing 150 and acts as a brake on the rotation of the upper housing 150 relative to the lower housing 110f. The more the friction material 180f brakes the rotation of the upper housing 110f, the more rotational resistance exists for the user. If the adjustment device 160 is turned counterclockwise, then the compression component 170f will vertically drop and allow the push bars 230f

to move radially inward and release some of the force imposed on the friction material 180f. Thus the braking force from the friction material 180f will decrease, and the rotational resistance between the upper housing 150 and the lower housing 110f will decrease.

A modification to each of the above-described embodiments is that an air bladder with a miniature pump can be inserted in place of the screw mechanism for the adjustment device. The air bladder and the miniature pump are of the types that are typically found in athletic shoes to provide additional support and/or cushion to feet.

One of ordinary skill in the art will appreciate that each of the above embodiments may be modified by replacing the upper housing with a disc and extending the lower housing main wall vertically. The extended lower housing wall is topped with a rim directed inwardly to secure the lower housing cap, the bearing element and the upper disc. The lower housing cap rests against an internal rim within the lower housing at the vertical height it would be located within each of the above embodiments. The outside rim around the lower housing is not necessary with this modification and would not be present.

To provide additional versatility to the apparatus of the invention, the user can attach the following accessories to one or a pair of these apparatuses.

The first accessory, as shown in Figure 10, is an additional height base 260 that preferably is manufactured from the same material used to make the lower housing and upper housing, for example a rigid polymer formed using injection or rotational molding. The base 260 could also be manufactured from rubber, metal or a variety of other similar materials. The height base 260 preferably is tapered radially inward from its base to its top. A recess or cavity 262 extends in from the top surface to nest one of the apparatuses. The recess 262 will extend up around the lower housing to a point short of where the upper housing shrouds over the lower housing.

A second accessory is an attachment to allow the use of the apparatus 295 with a weight machine 290 as shown in Figures 11(a)-(c). The attachment preferably

includes a support bar 272 with two small Velcro wraps 274 and two attachment rings 276. The support bar 272 preferably is made from metal. The support bar 272 also preferably is a flat strip of metal. The small Velcro wraps 274 are used to attach the support bar to the weight machine 290. The attachment rings 276 preferably are made from a rubber encased metal or rigid polymer ring 276a with the remaining portion of the ring being a Velcro wrap or cord material 276b to lasso an apparatus within the attachment ring 276. The attachment ring 276 wraps around the lower housing below the portion shrouded by the upper housing.

For exemplary purposes, the preferred measurements for the handle embodiment including the upper housing and the lower housing will be described and discussed. The upper housing has a diameter of 8 inches and a height of 1.5 inches. The upright portions are radially spaced in from the edge of the upper housing 0.5 inches. The shorter upright has a diameter of 1.625 inches through its entire height, and this diameter continues through the junction with the gripping area of the handle. The gripping area of the handle rises at an angle of 14 degrees from the horizontal plane along its bottom surface. The gripping area tapers similar to a conical shape such that prior to the junction with the taller upright portion the diameter is 1.0625 inches, which is maintained through the junction and into the taller upright portion. The taller upright portion tapers out to a base with a diameter of 1.375 inches. The upper housing thickness is 0.2±0.02 and the upper housing rim thickness is 0.30±0.02. The lower housing has a diameter, not including the rim, of 7.5±0.02 and wall thickness of 0.44±0.02 inches. The lower housing cap also has a diameter of 7.5±0.02 inches.

Those skilled in the art will appreciate that various adaptations and modifications of the above-described preferred embodiments can be configured without departing from the scope and spirit of the invention. In particular, one of ordinary skill in the art will appreciate that the invention may be assembled such that any reference above to clockwise and counterclockwise motion may be swapped such that counterclockwise will provide the effect discussed for clockwise. Therefore, it is to be understood that,

within the scope of the appended claims, the invention may be practiced other than as specifically described herein.